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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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EXAMINER	
TUBA, IR, T	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/432,112	TSUDA ET AL.	
	Examiner	Art Unit	
	John Juba	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-24 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-24 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a)☒ All b)☐ Some * c)☐ None of the CERTIFIED copies of the priority documents have been:

1.☒ received.

2.☐ received in Application No. (Series Code / Serial Number) _____ .

3.☐ received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Attachment(s)

14) ☒ Notice of References Cited (PTO-892)
15) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
16) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
17) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
18) ☐ Notice of Informal Patent Application (PTO-152)
19) ☐ Other: .

Claim Rejections - 35 USC § 112

Claims 1 – 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 5, 9, and 17 recite a dispersion compensator "in association with each of" said optical transmitter, said optical receiver, and said optical amplifier [emphasis added]. This recitation is ambiguous because, on its own, it suggests that an optical compensator is *connected at each location*. By contrast, dependent claims 12 and 20, refer to "said compensator" in the singular. This construction suggests that the meaning of "in association with" requires only a single compensator (at least) connected anywhere along the line in order to compensate for dispersion of signals *passing through* each of the receiver, the transmitter, and the optical amplifier. Reference to the specification does not resolve the ambiguity.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 4, 9, and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Delavaux, et al. Referring to Figure 4 and the associated text, Delavaux, et al

disclose a plurality of predetermined segment lengths in combination with optical amplifiers and a dispersion compensator providing a dispersion selected from a plurality of stepwise varying dispersions, which compensator is disclosed as locatable between pre- and post-amplifiers, at the transmitter, or at the receiver. Al though the compensators are not *connected at* each of the transmitter and the receiver, the compensators compensate for dispersion of signal "associated with each of the elements.

With regard to claim 4, Delavaux, et al disclose use of the compensator with fibers carrying wavelength division multiplexed signals (*e.g.*, Fig. 8).

With regard to claim 13, Delavaux, et al disclose the amplifiers as comprising pre- and post-amplifier stages, with the compensator connected therebetween, as best shown in Figure 2 (Col. 3, line 31).

Claims 1, 3, 9, and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Ishikawa, et al (U.S. Patent number 5,602,666). Referring to Figures 41, 42, and the associated text beginning in Column 41, Ishikawa, et al disclose a dispersion compensator providing a dispersion selected from a plurality of stepwise varying dispersions. Insofar as the channel dispersion is a function of length, the dispersions are inherently determined according to the length of the connecting fibers, and thus to the range of lengths. Ishikawa, et al disclose that a variable dispersion compensator (32) is "associated with" each of the transmitter location, the receiver location, and the

intervening repeaters. Although elements (22) are identified as "repeaters", Ishikawa, et al disclose that a pair of optical amplifiers are located at preceding and subsequent stages of the compensators (claim 7 of the reference), as exemplified in Figure 39.

With regard to claims 3 and 11, Ishikawa, et al disclose that the optical signal has a wavelength of about 1.55 μm, which corresponds with the flat portion of the EDFA gain characteristic (*e.g.*, Col. 21, lines 59+).

Claims 5 – 8 and 17 – 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Matsuda, et al (*Electron. Lett.*). Referring to Figure 1 and the associated text, Matsuda, et al disclose a method of dispersion compensation comprising the steps of providing a transmission line in the form of a first segment of single mode fiber (SMF) and a second segment formed of a dispersion-shifted fiber (DSF), and providing an optical transmitter, an optical receiver, and an optical amplifier at least between two of the segments. At the demultiplexer (AWG) it can be seen that the method includes provision of a dispersion compensator (DCF) in association with the signals passing through each of the transmitter, receiver, and optical amplifier, but not at the end of a dispersion-shifted fiber. The various features of the dependent claims are supported within the text of the disclosure.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2 , 4, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishikawa, et al. As set forth above for claims 1 and 9, Ishikawa, et al disclose the invention substantially as claimed. However, *in any one particular embodiment*, Ishikawa, et al do not disclose the transmission line segments as all being of single mode fiber with a 1.3 μm zero dispersion wavelength. Nonetheless, Ishikawa, et al expressly suggest use of the dispersion compensation method in systems composed of 1.3 μm zero dispersion wavelength single mode fibers conveying wavelength division multiplexed signals (Col. 3, lines 15 - 20). Thus, it would have been obvious to do so, in the interest of compensating for chromatic dispersion in such systems, as expressly suggested by Ishikawa, et al.

Claims 12 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishikawa, et al, in view of Miyauchi, et al (U. S. Patent number 5,877,881). As set forth above for claim 9, Ishikawa, et al disclose the invention substantially as claimed. Further, Ishikawa, et al disclose that an optical compensation will also be located at the transmitter and receiver. However, Ishikawa, et al do not disclose placement of the compensator with respect to post- and pre-amplifier in the manner recited.

In the same field of endeavor, Miyauchi, et al disclose an optical transmission system employing optical compensators provided at both the transmitter and receiver ends. Miyauchi, et al teach that these sections will typically include electro-optical (E/O) and opto-electrical (O/E) conversion elements to provide an interface with terminal equipment such as telephones. In order that the transmitter and receiver can be connected to the long-haul fiber, Miyauchi, et al teach inclusion of a post-amplifier and a pre-amplifier (respectively). In such arrangements, Miyauchi, et al teach appropriate placement of the dispersion compensator with respect to the amplifiers.

With regard to claim 12, it would have been obvious to one of ordinary skill to include a post-amplifier in combination and with E/O converters, in the interest of providing an interface with terminal equipment and allowing the transmitter to drive the long haul fiber directly, as taught by Miyauchi, et al. The recited placement of the dispersion compensator is further suggested by Miyauchi, et al.

With regard to claim 14, it would have been obvious to one of ordinary skill to include a pre-amplifier in combination and with O/E converters, in the interest of providing an interface with terminal equipment and allowing the receiver to connect with the long haul fiber directly while buffering the optical signal for the O/E converters, as taught by Miyauchi, et al. The recited placement of the dispersion compensator is further suggested by Miyauchi, et al.

Allowable Subject Matter

Claims 15, 16, and 20 - 24 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter:

The prior art, taken alone or in combination, fails to teach or to fairly suggest the combination of

an optical fiber transmission line composed of a plurality of segments each falling within a predetermined range, an optical amplifier between any two adjacent segments, an optical transmitter, an optical receiver, and a dispersion compensator associated with each of the amplifier, transmitter, and receiver and providing dispersion selected from a plurality of stepwise varying dispersions according to said predetermined range, wherein the compensator is provided between front and rear stage amplifiers of either a transmitter having E/O convertors and an optical multiplexer or a receiver having O/E convertors and an optical multiplexer, as recited in claim 15 or 16, or

an optical transmission system comprising an optical transmission line including both SMF segments and DSF segments, an optical amplifier connected between any two adjacent segments , an optical transmitter, an optical receiver, and a dispersion compensator associated with each of said amplifier, transmitter, and receiver, except that corresponding to at least one end of the DSF transmission fiber segment, wherein

the compensator is provided between the E/O converter and the post-amplifier of the optical transmitter, as recited in claim 20;

the compensator is provided between the front-stage and cascaded rear-stage of the optical amplifier, as recited in claim 21;

the compensator is provided between the pre-amplifier and O/E convertor of the receiver; or

the compensator is provided between front and rear stage amplifiers of either a transmitter having E/O convertors and an optical multiplexer or a receiver having O/E convertors and an optical multiplexer, as recited in claim 23 or 24.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Mikami, et al disclose a dispersion compensation scheme for WDM optical transmission lines.

Blaszyk, et al disclose an optical transmission channel including switchable lengths of dispersion compensating fibers.

Onaka, et al disclose a dispersion compensation arrangement including pre-chirping means, amplifiers with dispersion compensating fibers, residual dispersion compensation at a receiver or transmitter, and suggest *a structure whereby all dispersion is compensated in a single unit by combining sub-units.*

Dugan discloses a dispersion compensating scheme for long-haul fiber communication.

BRITISH TELECOMMUNICATIONS LTD (WO 97/37446) disclose a switching arrangement for dispersion compensating WDM fiber networks.

KOKUSAI DENSHIN DENWA Co. LTD (GB 2,268,018 A) teach that a length of single mode fiber with zero dispersion wavelength of 1.3 μm can be used to compensate for chromatic dispersion accumulated in a length of dispersion shifted fiber (Fig. 4, text Pg. 14).

J. F. Jacob, et al (OFC '97 Technical Digest) disclose a dispersion-managed fiber transmission system where the transmission line employs both dispersion-shifted fibers (DSF) and standard single-mode fibers (SMF).

Masahito Tomizawa, et al (*J. Lightwave Techn.*) disclose a variable dispersion compensating device comprising selectable segments of 1. 3μ zero dispersion SMF and DCF and for adaptive compensation of DSF transmission line.

X. Y. Zou, et al (*J. Lightwave Techn.*) discuss the relative merits of dispersion compensation scheme employing different fiber combinations.

Ting-Kuang Chiang, et al. (*J. Lightwave Techn.*) discuss the relative merits of lumped and distributed dispersion compensation methods with respect to cross-phase modulation.

M. I. Hayee, et al (*IEEE Photonics Techn. Lett.*) discuss the relative merits of pre-, post-, and dual-compensation methods in dispersion-managed WDM systems employing mixed fiber type transmission lines.

K. Takiguchi, et al (*Electronics Lett.*) discloses a group-delay dispersion compensator variable step-wise for selected fiber lengths.

K. M. Guild, et al (*Electronics Lett.*) disclose a mixed fiber type transmission line (pure-silica and DSF) connected with a transmitter, a receiver, an amplifier, and a dispersion compensating arrangement.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (703) 308-4812. The examiner can normally be reached on Mon.-Fri. 9 - 5.

The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722, 7724 for regular communications and (703) 308-7721 (notify examiner) for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

John Juba
March 19, 2001

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